

B.Tech I Year

Regular Course Handbook

Subject Name: Fund. of Electrical Engineering (Unit-5)

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B.Tech First Year: Regular Course Lecture Plan Session 2022-23

Subject Name		Electrical Engineering	
Unit No.	Unit Name	Syllabus Topics	Lecture No
1	DC Circuits	Concepts of network, Active and passive elements, voltage and current sources. Concept of linearity and linear network, unilateral and bilateral elements. R, L and C as linear elements.	1
		Voltage source, Current source transformation, Kirchhoff's laws .	2
		Mesh analysis with Numericals	3
		Mesh analysis with Numericals	4
		Nodal analysis with Numericals	5
		Nodal analysis with Numericals	6
2	Steady State Analysis Of Ac Circuits	Concepts of AC fundamentals: r.m.s value and average value	7
		Form factor and peak factor of different waveforms	8
		Concept of phase & phasors, phasor representation of sinusoidally varying voltage and current wave	9
		Analysis of pure R, pure L and pure C circuit with power	10
		Analysis of Series RL, RC, RLC ckt and power traingle	11,12
		Resonance in series circuit, it's frequency & characteristics	13
		Bandwidth and quality factor	14
		Parallel Resonance and numericals on parallel R,L,C circuits	15,16
		Three phase star and delta connections	17,18
		Magnetic Circuits	19
3	Transformers	Single phase transformer: construction and working	20
		Ideal and Practical transformers with phasor and equivalent circuit	21
		Equivalent circuit of transformer with numericals	22
		Power losses in transformer	23
		Efficiency of transformer and numericals	24
		Maximum efficiency of transformer	25
		Voltage regulation of transforms at load	26

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Subject Name	Electrical Engineering
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Signature	
Name of Subject Head	Mr. Ashok Kumar Rajput

Unit-5 : ELECTRICAL INSTALLATION

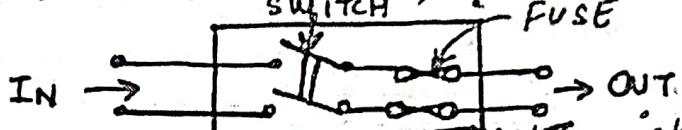
(V.Imp.)

COMPONENTS OF L.T. SWITCH GEAR - I ON

SWITCH FUSE UNIT (SFU) AKTU (20-21, 19-20, 18-19)

Ques: What is SFU (switch fuse unit)? State its advantage.

Ans:



- * A Fuse is a protective device which acts quickly.
- * In abnormal condition, it blows and disconnects the circuit from the supply. Thus, it provides circuit protection by destroying itself.
- * A Switch is used to isolate the circuit from the supply purposely for repair and maintenance. Generally, it is manually operated.
- * A unit which consists of the combination of Fuse and switch together is called Switch Fuse Unit.

ADVANTAGES OF SFU

- * Number of joints in the circuit gets reduced.
- * Due to compact construction, less space is required.
- * Easy from handling point of view.

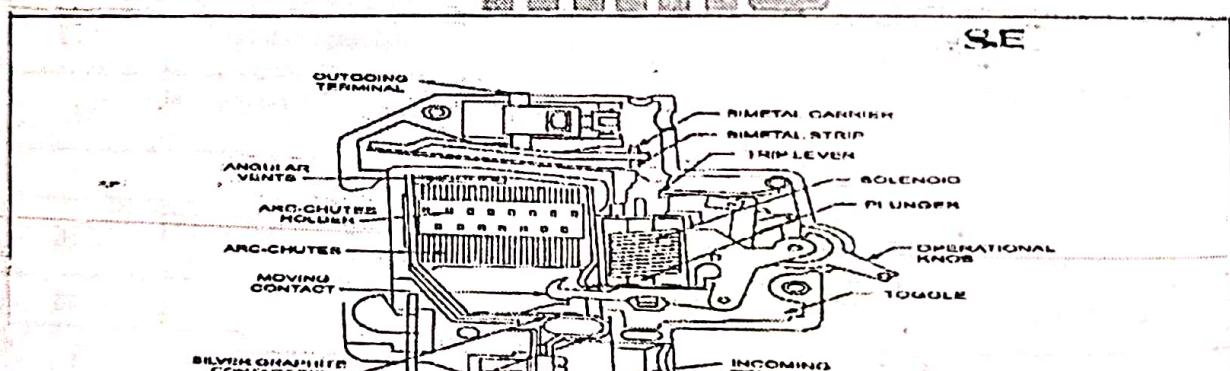
Ques: Explain the working of Miniature Circuit Breaker (MCB)

MINIATURE CIRCUIT BREAKER (MCB) (19-20, 20-21)

- * A miniature circuit breaker is an electromechanical device which makes and breaks the circuit in normal operation and disconnects the circuit under the normal condition when current exceeds a preset value.
- * MCB is a high fault capacity current limiting, trip free, automatic switching device with thermal and magnetic operation to provide protection against overload and short circuit.

- * It is necessary to use MCB because of its features:
 - a) Its operation is very fast and opens in less than one millisecond.
 - b) No tripping circuit is necessary and the operation is automatic.
 - c) Provide protection against overload & short ckt without noise, smoke or flame.
 - d) It can be reset very quickly after correcting the fault, just by switching a button.
 - e) No rewiring is required if fault persists.
 - f) It cannot be reclosed if more than one fault occurs.
 - g) The mechanical life is upto or more than one lakh operating cycle.
 - h) Current Rating of MCB is from 0.5A to 63A.

MCB



Miniatute Circuit Breaker

Ques: Imp.

COMPARE MCB with FUSE

S.NO.

FUSE

* Operation is highly dependent on selection of its proper rating. If it is not selected properly, it results in non-operation in case short ckt.

Lecture No: 43

* MCB instantly disconnects the supply automatically in the event of short ckt or over load. Thus, it eliminates the risk of fire & prevents damage to wiring system.

* If the fuse wire after operation is replaced with another one but goes loose, then it may be dangerous. Also to replace a blown fuse in low current carrying points is dangerous specially in dark.

* Restarting the power supply after tripping due to overload or short circuit is easy.

Ques During replacement of fuse wire, the exact size of fuse wire may not be available. Also, for replacement, a kit of hand tools has to be kept ready.

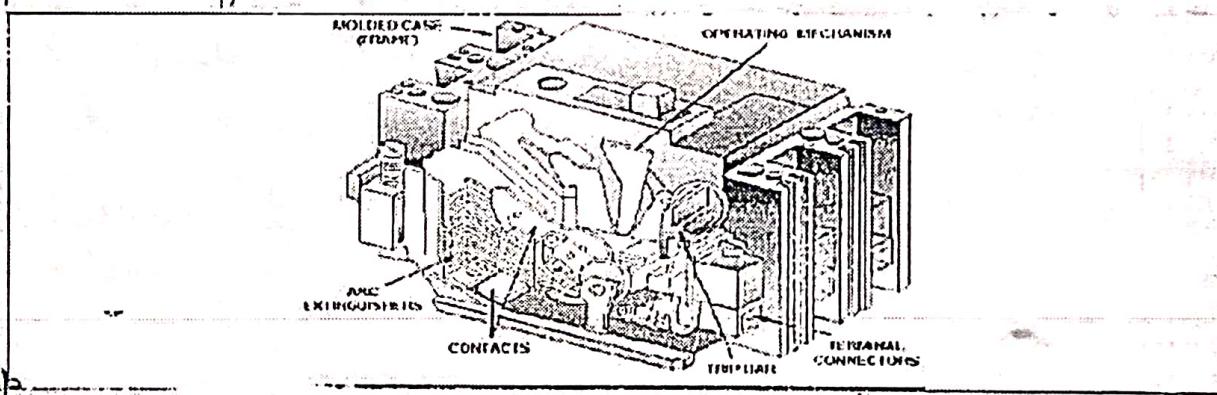
3. MOULDED CASE CIRCUIT BREAKER (MCCB)

Ques Explain the construction and working of MCCB.

Ans MCCB is similar to MCB but used when the load currents exceeds the capabilities of MCB. It is used for circuit having current ranges from 63A to 3000A.

- * Its working is based on thermal mechanism. It has a bimetallic contacts which expands & contracts when there are changes in temperature. Under normal condition, the contacts are closed allowing the current to pass.
- * Under Overload or short ckt conditions, current exceeds the safe value, due to this heat is generated and contacts are opened to interrupt the circuit.
- * Due to interruption of high current, there is an arc formation. To suppress this arc, arc extinguishers are used.

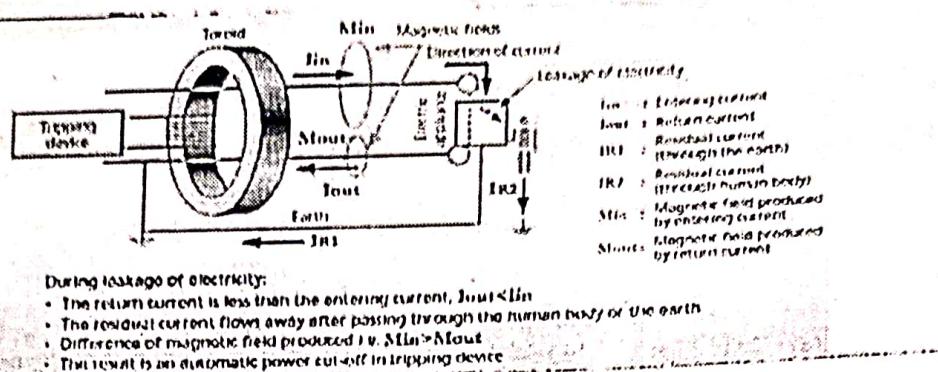
- * There is a disconnection switch, with the help of which, MCCB can be operated manually.
- * Practically, it has adjustable trip settings & hence it can be used for high current applications.
- * It can be easily reset after the fault correction.
- * All the operating parts of MCCB are covered within a plastic moulded housing made in two halves & they are joined to form a whole structure.
- * MCCBs are used for industrial and commercial applications such as main Feeder protection, generator and motor protection, capacitor bank protection, welding applications & applications require adjustable trip setting.



Ques: Explain the working of Earth Leakage Ckt Breaker (ELCB).

4 EARTH LEAKAGE CIRCUIT BREAKER (ELCB)

ELCB is used to protect the circuit from the electrical leakage. When someone gets an electric shock, then this circuit breaker cuts off the power at the same time of 0.1 secs for protecting the personal safety & avoiding the gear from the ckt against short ckt and overload.



ELCB consists of a small current transformer surrounding live and neutral wire. The secondary winding of CT is connected to relay circuit which can trip the ckt breaker which is connected in the circuit.

Under normal conditions, the current in the line and neutral conductor is same so that net current ($I_L - I_N$) through the core is zero. So, no flux production in core & no induced E.M.F. ∴ ckt breaker does not trip.

If there is a fault due to leakage from live wire to earth or a person by mistake touching to the live terminal, then net current flowing in the core will not be zero but equal to ($I = I_L - I_N$) which sets up the flux & E.M.F in CT.

As per the preset value, the unbalance in the current is detected by C.T. and relay coil is energized which will give up tripping signal for the ckt breaker to break the circuit to reduce the risk of electrocution.

AIR CIRCUIT BREAKER

- ↳ (a) An air circuit breaker (ACB) is an automatically operated electrical switch that uses air to protect an electrical circuit from damage caused by excess current from an overloaded or short circuit.
- ↳ Its primary function is to interrupt current flow after a fault is detected. When this happens, an arc will appear between the contacts that have broken the circuit. Air circuit breakers use compressed air to blow out the arc or alternatively, the contacts are rapidly moving into a small sealed chamber, the escaping of the displacing air, thus blowing out the arc.

↳ Types of Air circuit breakers

1. Plain Air circuit breaker
2. Air blast circuit breaker



TYPES OF WIRES :

^(V. Imp.)
Ques: Explain various types of wires used in electrical installation. AKTU (2018-19, 20-21)

Ans: Vulcanised India Rubber Wire (V.I.R)

* It consists of tinned conductor coated with rubber insulation and is further covered with protective cotton and bitumen compound & finally finished with wax.

It makes it moisture and heat resistant.

It is available in single core only.

These wires are covered with cotton as it has tendency to absorb moisture & hence are rarely used, now a days.

Cab Type Sheathed Wire (C.T.S)



* In this type, ordinary rubber insulated conductors are provided with an additional tough rubber sheath. It is also called Tough Rubber Sheathed (T.R.S) wire.

Provides additional insulation and along with that a protection against moisture, chemical fumes & wear and tear. Available in single core, double core & three core varieties.

3.

Polyvinyl Chloride Wires (P.V.C)

- * Most commonly used wires with PVC insulation.
- * It is non-hygroscopic and moisture proof.
- * It is tough and hence durable.
- * Resistant to corrosion.
- * It is chemically inert.
- * As it is tough, so additional covering is not required.

DISADVANTAGE:

- * It softens at high temperature & hence it is avoided where extreme of temp. may occur. for eg. in heating appliances.

4. Flexible Wires

- * Used very commonly in domestic wiring.
- * It consists of two separately insulated stranded conductors. Insulation is mostly rubber & more commonly available in parallel or twisted pairs.
- * Due to its flexible nature, the handling of these wires become very easy.

TYPES OF CABLES

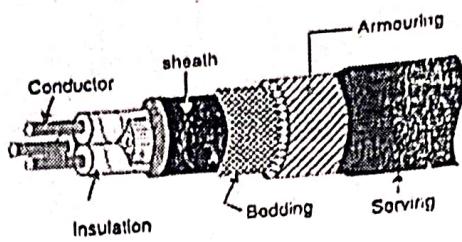
(v. imp.)

Ques: Explain the construction of single core underground cable. AKTU (2018-19), (20-21)

Ans: An underground cable is defined as the group of individually insulated one or more conductors which are put together and finally provided

with number of layers of insulation to give proper mechanical support.

Its various parts are :-



* Conductor or Core: This section consists of single conductor or more than one conductor. The conductors are also called cores. Cables with three conductors used are aluminium or annealed copper. The conductors are stranded conductors in order to provide flexibility to the cable.

* Insulation: Each conductor or core is covered by insulation of proper thickness. Commonly used insulating materials are Varnished cambric, vulcanized bitumen and impregnated paper.

* Metallic Sheath: The insulated conductors are covered by lead sheath or aluminum sheath. This provides mechanical protection but mainly restricts moisture and other gases to reach the insulation.

* Bedding: Metallic sheath is covered by another layer called bedding. Bedding consists of paper type compounded with a fibrous material like Jute strands or hessian tape. Purpose of bedding is to protect the metallic sheath from corrosion & from mechanical injury resulting due to armoring.

* Armoring: This layer consists of the layers of galvanized steel wires which provide protection to the cable from mechanical injury.

* Sewing: The last layer above the armouring sewing. It is a layer of fibrous material like jute cloth which protects the armouring from the atmospheric conditions.

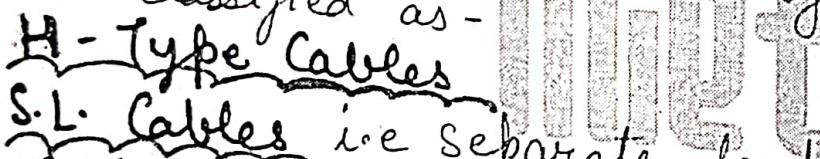
Ques: Explain various types of cables. AKTU (2018)

Ans: Based On Voltage level, the various types of cable are:

1. Low Tension Cable: Used for the voltage levels upto 6.6 KV.

2 Medium Tension Cable: Used for 11 KV level & 3 Belted Cable.

3 High Tension Cable: Used for 22 KV and 33 KV levels. These are screened type cables & are further classified as -



4 Extra High Tension Cable: Used for voltage levels more than 33 KV. These are pressure cables which are further classified as -

Oil filled Cables.
Gas pressure Cables.

Based On Core

1 Single Core Cable.

Various cables are -

2 Two Core Cable.

3 Three Core Cable.

AKTU (20-21, 19-20)

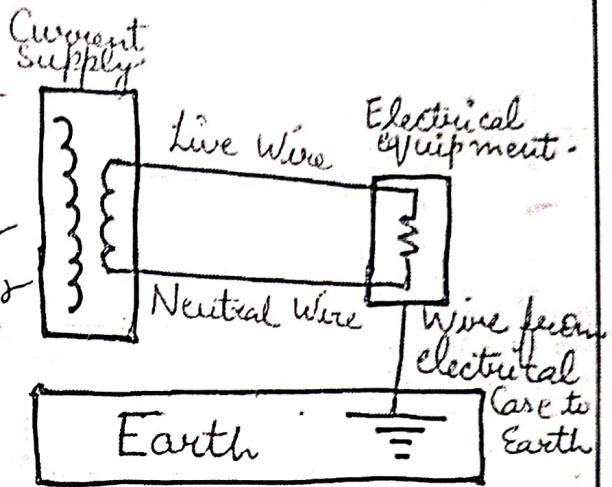
(18-19)

IMPORTANCE OF EARTHING

Ques: what is earthing? Explain its importance.

Ans:

* The connection of electrical machine to the general mass of earth, with a conducting material of very low resistance is called Eartthing or grounding.



* Earthing brings the equipments to zero potential and avoid the EARTHING shock to the operator, under any fault condition.

IMPORTANCE OF EARTHING:

Consider a machine which is not earthed. It is operated at supply voltage 'V'. If a person touches to the outer part of the machine then as long as an insulation of the machine is perfect, person will not get a shock. The insulation resistance of perfect insulation is infinite.

* but if there is some fault and insulation becomes weak or if one of the winding is touching to the cover of the machine, then insulation resistance becomes zero. If a person touches to such a machine, current flows through the body of the person towards the earth. As body resistance is small, current through the body is high so that the person receives a shock.

To avoid such a situation, the body of the m/c is connected to the earth with a very low resistance. This is called Earthing.

* If a machine is earthed and the person touches to a faulty machine then body resistance and earthing resistance appears to be in parallel.

∴ Earthing Resistance \ll Body resistance

∴ almost entire current flows through earth connection and the person does not receive any shock.

* Earthing is necessary for all domestic appliances, machines, buildings and structures, equipments, power stations etc.

TYPES OF EARTHING

PLATE EARTHING: A Copper plate or galvanised plate is buried in an earth pit below ground level. The plate electrode connects the electrical conductors to the earth.

PIPE EARTHING: A galvanised steel perforated pipe inside the ground connects the electrical conductors to the earth.

ROD EARTHING: Similar to the pipe earthing. A Copper rod replaces the pipe electrode.

CHEMICAL EARTHING: Similar to the pipe earthing. A chemical compound material replaces the charcoal and salt layers.

Ques: Explain the plate earthing in detail. (NOT IN AKTU NOW)

Ans:

* Earth connection is provided with the help of copper plate or Galvanised Iron (G.I.) plate. The copper plate size is 60 cm * 60 cm * 3.18 mm ~~plate~~. while G.I. plate size is not less than 60 cm * 60 cm * 6.3 cm. The plate is embedded 3m (10 feet) into the ground & is kept with its face vertical.

Lightning & Earthing Protection

For the protection of electrical substation or equipment of substation from lightning surge, a properly installed Lightning Protection System is required.

Question-1 what are the components of Lightning Protection System?

L A. properly installed lightning protection system will provide an enhanced grounding network for lightning's destructive electricity as it is directed safely into the ground, leaving the building, occupants & contents unharmed.

L It consists of 4 key components :-

* Air terminals.

* Conductors/ Bonding

* Grounding

* Transient / Surge Protection.



L Air terminals, also known as "lightning rods", are the top portion of the protection system.

This is where the lightning first makes initial contact with the facility.

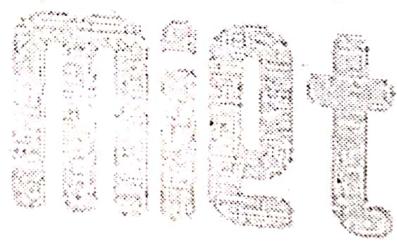
L Conductors, conduct the lightning strike safely from the air terminals to the ground. Bonding assures that all the metals utilized are at the same electrical potential.

L Grounding, the most vital part of a lightning protection system. It is achieved when all equipment in a facility are connected to a master bus bar.

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This in turn is bonded to the external grounding system at one point only. This approach to grounding is utilized because it reduces AC impedance and DC resistance.

In Transient/Surge Protection, the final component of lightning protection system. This consists of incorporating surge protection devices on all incoming services.



In places where rocky soil earth bed exists, horizontal strip earthing is used.
In ordinary soil condition, the range of the earth resistance should be 2 to 5 ohms
in rocky soil, earth resistance is from 5 to 8 ohms

BATTERY

A device that converts the stored chemical energy into electrical energy using chemical action is called battery.

CLASSIFICATION OF BATTERIES : [V.Imp.]

or

COMPARISON B/w PRIMARY & SECONDARY BATTERIES

AKTU(18-19)

PRIMARY BATTERY

- * Initial cost is less.
- Cost per kWh is high.
- As these batteries are disposable, there is no requirement of maintenance.
- Most suitable for portable application since it is smaller & light weight in nature.
- Has good charge maintenance.

SECONDARY BATTERY

- * Initial cost is high.
- Cost per kWh is less.
- As these batteries are rechargeable, regular maintenance is required.
- Less suited for portable applications.
- Has poor charge maintenance.

B. Tech I Year Prerequisites [Subject Name: Electrical Engineering]

* Not suitable for heavy load applications since the discharge rate is poor.

In general, these batteries are limited to specific applications.

Ex- Alkaline batteries, Mercury batteries, Silver-oxide batteries, Zinc Carbon batteries etc.

* Suitable for heavy load applications due to its superior discharge rate.

Due to inherent versatility, these batteries are used in most of the applications.

Ex- Nickel Cadmium, Lead-acid Batteries, Lithium batteries etc.

TYPES OF BATTERIES :

1) TYPES OF BATTERY

1) Lead Acid Battery



APPLICATIONS

In automobiles for starting and lighting, battery electric vehicles, back up operations like rail road signals, air traffic controls and critical system in submarines etc.

2) Nickel-Cadmium Battery

In railways for lighting & air conditioning systems, for starting engines and provide emergency power supply in military aeroplanes & helicopters, in movie cameras and photoflash, in electric shaver etc.

3) NiMH Battery (Nickel Metal Hydride)

Cellular phones, portable computers and laptops, digital cameras, electronic toys etc.

4) Lithium ion Battery

* Consumer products such as camcorders, calculators, electric razors, medical equipments, portable radios, in traction applications etc.

5) SMF Battery (Sealed Maintenance Free)

* UPS systems, telecommunications equipments, fire alarm and security system, solar lanterns, emergency lights, office automation equipments etc.

COMPARISON B/W THESE BATTERIES :

Lead Acid

* Low internal resistance.

* Nominal Battery voltage is 2 V.

* Charge & discharge cut off voltage is 2 V and 2.4 V.

* Less maintenance is required.

* Efficiency is approx. 90%.

* Very high toxicity level.

* Thermally stable. Charging time of battery is 8-16 Hrs.

Nickel Cadmium

* Very low internal resistance.

* Nominal Battery voltage is 1.2 V.

* Charge & discharge cut off voltage are 1.2 V & 1 V.

* Moderate maintenance is required.

* Efficiency is approx. 70 - 90%.

* Very high toxicity level.

* Thermally stable. Charging time is 1-2 Hrs.

* Medium internal resistance.

* Nominal Battery voltage is 3.2 - 3.7 V. Charge & discharge cut off voltage are 4.2 V & 2.5 V.

* Free from maintenance.

* Efficiency is 99%.

* Low toxicity level.

* Requires shunt protection for stability. Charging time is 1-4 Hrs.

IMPORTANT CHARACTERISTICS OF BATTERIES

Ques: Explain the important characteristics for batteries.

AKTU(19-20, 18-19)

Ans: The various important characteristics of Batteries are:

1) Nominal Voltage: It is indicated on a battery depending on the amount of cells connected in series. It is open circuit voltage of the battery.

2) Battery capacity or Battery life: It is specified in Amperes hours (AH).

It indicates the amount of electricity which a battery can supply at the specified discharge rate till its voltage falls to a specified value.

Mathematically, the product of discharge current (I_D) in amperes and the time for discharge (T_D) in hours till voltage falls to a specified value is the capacity of a battery.

$$\text{Battery Capacity} = I_D * T_D (\text{AH})$$

3) Specific gravity of electrolyte: More the specific gravity of electrolyte, more is the battery capacity. It decides internal resistance of a battery.

4) Specific Energy: The battery capacity expressed in Watt-hour per Kg weight is called specific energy. It is also called gravimetric energy density of a battery.

5) Electrical Characteristics: These characteristics include the charging and discharging curves for a battery.

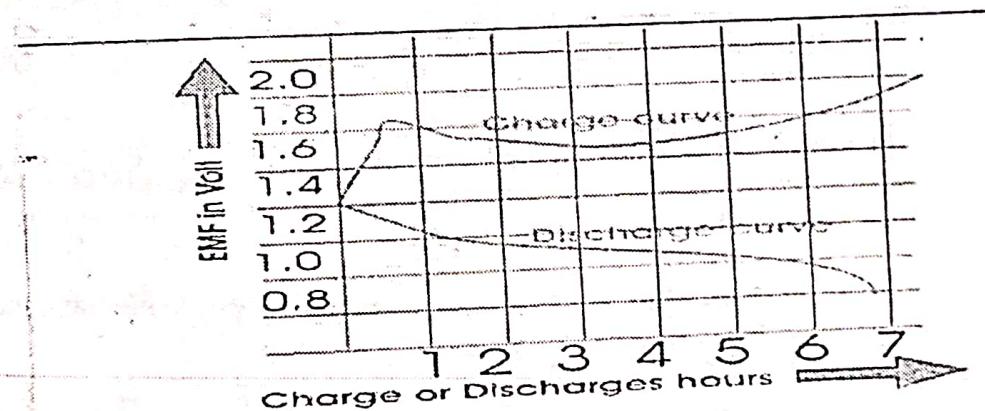
It is the graph of terminal voltage against charging or discharging time in hours at Normal rate.

Ques: Draw the characteristics of battery.

A&TB (2018-19)

* The emf of a fully charged Nickel-Iron Battery is 1.4 V. The average discharge voltage is about 1.2 V and the average charging voltage is about 1.7 V per cell.

* The voltage characteristics of the Nickel Iron battery are similar to that of the lead-acid cell. As the fully charged emf is 1.4 V and it slowly decreases to 1.3 V & then very slowly to 1.1 or 1.0 V during discharge.



Characteristics of Edison Battery

From the graph, we can see that there is no lower limit for discharging emf beyond which the O/P of the battery will be zero. That's why after a certain period, the battery stops to give O/P. The emf of a battery is directly proportional to the temperature, which means the emf of a battery increases with increase in temperature.

* The average time of charging of a battery is 7 hours and discharging time is 5 hours.

* Another characteristic of Edison Battery is that continuous operation at higher temperature decreases the life of a battery, the same thing happens if the battery is charged for more than the average time of charging.

The Ampere-Hour and Watt-Hour efficiency of this nickel-iron battery is 85% and 60% respectively.

At 4°C temperature, the capacity of Edison battery falls to zero, that's why the battery should be heated up before operation, though during operation the I^2R loss keeps the battery hot and running.

6) Battery Efficiency: It is defined as the ratio of the W_P during Discharging to the input required during charging, to regain the original state of battery.

It is commonly called Ampere-Hour efficiency or Quantity efficiency & denoted as η_{AH} .

$$\therefore \eta_{AH} = \frac{\text{Current} * \text{Time On Discharge} * 100}{\text{Current} * \text{Time On Charge}}$$

* For lead acid battery, it is about 80% to 90%.

Ques: Calculate the backup of battery of 100 AH connected to load of 100 Watts and supply voltage is 2V.

AKTU (2018-19)

Soln:

$$\text{Battery Backup} = \frac{100 \text{ AH} \times 12 \text{ V}}{100 \text{ Watt}} = 12 \text{ Hours}$$

Ques: An alkaline cell is discharged at a steady current of 4 Amperes for 12 Hours, the average terminal voltage being 1.2 V. To restore it to original state of voltage, a steady current of 3A for 20 Hours is required, the average terminal voltage being 1.44V. Calculate Ampere-hour and Watt-hour efficiencies.

Soln

$$I_D = 4 \text{ A}, T_D = 12 \text{ hrs}, V_d = 1.2 \text{ V}$$

AKTU (19-20, 20-21)

$$I_C = 3 \text{ A}, I_D = 20 \text{ hrs}, V_C = 1.44 \text{ V}$$

$$\therefore \eta_{AH} = \frac{I_D \times T_D \times 100}{I_C \times T_C} = \frac{4 \times 12 \times 100}{3 \times 20} = 80\%$$

$$\therefore \eta_{WH} = \frac{I_D \times T_D \times V_D}{I_C \times T_C \times V_C} = \frac{4 \times 12 \times 1.2}{3 \times 20 \times 1.44} = 66.66\%$$

V.Imp: Ques: Calculate the energy consumption per day in a house using 5 CFLs of 20W each, 3 fans of 60W each for 3 hrs a day. AKTU (2018-19)

$$\text{Soln: } \text{KWh} = \frac{(5 \times 20 \times 3) + (3 \times 60 \times 3)}{1000}$$

$$= 0.84 \text{ KWh (Unit)}$$

Imp.

BATTERY BACK UP

Ques: What is Battery Backup device? Explain its,

Ans: A Battery backup device is an AKTU (2018-19) electronic device that supplies secondary power in absence of main power. It can also protect electronic hardware from power spikes and fluctuations. The main battery backup device which is commonly used is called Uninterruptible Power Supply (UPS).

NEED OF UPS :

* Most of the systems operate on a.c supply. The a.c supply failure causes periodical stoppage of the various systems.

* Most of the modern systems are computers and microprocessors. Any interruption in the power supply may result into the loss of the work and make system ineffective.

* Many important places like hospitals, temples, playing grounds, banks etc. require continuous supply for their efficient operation.

To avoid all these adverse and serious situations, battery backup is necessary and is provided by using UPS.

BUSBAR

- ↳ Busbars also referred as bus bar are fascinating parts of engineering making complex power distribution simpler, more affordable and flexible.
- ↳ The main function of busbars is to conduct a substantial current and are typically housed inside switchgear, panel boards.
- ↳ Rather than branching the main supply at one location, busbars allow new circuits to branch off anywhere along the route of the busway.
- ↳ It connects high voltage equipment at electrical switchboards, and low voltage equipment in battery bank.

Question :- How do Busbars work ?

- ↳ Electrical Busbars are conductors or a group of conductors used for collecting electric power from incoming feeders. From there, they distribute the power to the outgoing feeders. In laymen's terms, it is type of electrical junction where all incoming and outgoing electrical currents meet.

Question :- What are the applications of busbars ?

- ↳ Busbars are produced in a variety of shapes, such as flat strips, solid bars or rods. They are typically composed of copper, brass or aluminum. As solid or hollow tubes.
- ↳ We consider two types of busbars - laminated and flexible.
- ↳ Laminated busbars are widely used in following applications :-
 - (i) Base station
 - (ii) Power switch station systems
 - (iii) Telephone exchange Systems
 - (iv) Cellular communication Systems.

* Flexible busbars are used in :-

- (i) Transformer and charging stations
- (ii) Electrical connection in switching cabinets
- (iii) Electric, Hybrid and fuel cell vehicles.

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Factors Affecting Battery Capacity

The battery capacity is affected by several factors among them the following:

1. Charging and discharging rates.

When a battery is discharged very fast, the total energy extracted from the battery is reduced and the battery capacity is lower. Similarly when the battery is charged at a rapid rate, the amount of energy stored in the battery is reduced hence reduced capacity.

Remember the battery stores and gives energy by way of chemical reactions, when the discharge or charge current is high, the necessary components for the chemical reactions to occur do not have sufficient time to chemically react. Only a fraction does hence the reduced total energy of the battery.

2. Temperature

The efficiency of chemical reactions is a factor of temperature inside the battery. Higher temperatures will result in faster chemical reactions as compared to lower temperatures.

Higher battery temperatures is a two edged sword as it increases the battery capacity and efficiency, it at the same time reduces battery lifetime.

You should not be deliberately increasing battery temperature as this will inadvertently destroy the battery.

3. Battery age and history

As the battery ages, its ability to store charge will decrease as not all chemical reactions will be reversed by charging. As the battery charges and discharges, new chemical compounds that are hard to break will be formed. This will mean less and less chemical components are available for storing energy.

The battery capacity will stay at or close to the rated capacity for only a limited number of charge and discharge cycles.

5 Year's

Difference Between Earth and Neutral

Earth	Neutral
It is the least resistant path and is used for safety purposes against residual currents	In an AC circuit which carries current in normal conditions, it is the return path that balances the load
In normal conditions, it doesn't carry any current, but in case of insulation failure, it might carry minor current	A neutral wire is always charged
It cannot be turned into neutral	It can be turned into earth
It can come from a neutral line or can be separately executed	It comes from a neutral line
Earth is the surging point of appliances	Neutral is the return path of the electrical current supply. It is also called a reference point

B. Tech I Year [Subject Name: F. of Electrical Engineering]